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| 21839 7590 01/08/2008<br>BUCHANAN, INGERSOLL & ROONEY PC<br>POST OFFICE BOX 1404<br>ALEXANDRIA, VA 22313-1404 |             |                      | EXAMINER<br>HU, HENRY S         |                             |
|   |             |                      | ART UNIT<br>1796                | PAPER NUMBER                |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|                              |                               |                               |  |
|------------------------------|-------------------------------|-------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/501,844 | Applicant(s)<br>ZAGHIB ET AL. |  |
|                              | Examiner<br>Henry S. Hu       | Art Unit<br>1796              |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on Election of October 25, 2007.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 6-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☒ Claim(s) 1,2 and 4 is/are objected to.
- 8) ☒ Claim(s) 1-35 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>12-20-2007</u> . | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. This Office Action is in response to Election along with Amendment filed on October 25, 2007 as well as an IDS (1 page) filed on December 20, 2007. **Claims 1-2, 4-5, 10-13, 16-26 and 30-34** were amended to only remove the improper use on “preferably”, while no claim was cancelled or added.

**Applicant's election of Group I (Claims 1-5 is traversed with remarks on page 9.**

The traversal is on the ground(s) that it would not place an undue burden to search and examine the non-elected Group II (Claims 6-15), Group III (16-27 and 32-35), Group IV (Claims 28-29) and Group V (Claims 30-31) with Group I since they are so closely related in polymeric electrolyte.

Group I was drawn to a polymer electrolyte material; Group II was drawn to a crosslinkable electrolytic “composition”, while each of Group III, Group IV and Group V was drawn to a different electrochemical device. It is found that even the same polymer electrolyte from Group I is indeed containing in each of four other groups including Group II, Group III, Group IV and Group V as a major component; each group still has different scope, process of making and process of using. To be more specific, the crosslinking function in the composition of Group II will certainly make Group II quite distinct from Group I. Based on the same rationale, the crosslinking function in Group V will also make Group V quite distinct from

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Group III or Group IV. The scope of Group III is at least somewhat different from that of Group IV.

Applicants' argument for restriction requirement is as "Each of Ishiko-US, Kono, or Ishiko-EP relate to a tetrafunctional polymer (a one four branched polymer). However, there is no teaching or suggestion in any of the cited art to have an electrolytic composition comprising one four branched polymer having a hybrid termination and another compound of the claimed types of **PVDF**, PVDF-HFP, PTFE, EDPM, polyvinyl alcohol, cellulose, ethylene oxide condensation products, PMMA, PAN, SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> or nano TiO<sub>2</sub>" (see page 9 at bottom section of Remarks). In the course of making crosslinked polymer electrolyte, **poly(vinylidene fluoride) (PVDF) is indeed found to be incorporated as a key component** in addition to using the mixture of a tetrafunctional high-molecular compound and an electrolyte salt. See Ishiko (US 6,190,804 B1) at working examples 1-12; abstract, line 1-4.

The requirement for this PCT case is now deemed proper and is therefore made FINAL. **Claims 1-35** with **two** independent claims (**Claim 1 and Claim 28**) are now pending, while non-elected **four** groups including Group II (Claims 6-15), Group III (16-27 and 32-35), Group IV (Claims 28-29) and Group V (Claims 30-31) are all withdrawn from consideration. The examiner accepts Applicants' **six** drawing sheets with **Figures 1-7** (a brief description is on page **4**). An action follows.

### Claim Objections

2. **Claims 1-2 and 4 are objected to** because of the following informalities:

(a) On **Claim 1** at line 4 of page 3 as well as may be in some claims, the term "**preferably**" as described is a relative term, which renders the claim **indefinite**. The term "**preferably**" is not defined by the claim or any dependent claim for the low and high limit, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably appraised of the scope of the invention. See MPEP § 2173.05(b). It is suggested citing such a limitation on a dependent claim. It is noted that **Claims 1-2, 4-5, 10-13, 16-26 and 30-34** have been amended to remove the improper use on "preferably".

(b) On **Claim 1**, page 3 at line 7, the monovalent functional group "**OCH<sub>4</sub>OH**" is wrong. A correction to "**OCH<sub>2</sub>OH**" or "**OC<sub>2</sub>H<sub>4</sub>OH**" is needed.

(c) On **Claim 2** at lines 1-2, the language "additionally containing" may needs to change to "further comprising" according to traditional writing. Accordingly, Claim 1 at line 1-2 may also need to rewrite so as to use the language "comprising". Examiner suggests **further** rewriting **Claim 1** into a more clarified format. Otherwise, it is unclear that **SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> and nano TiO<sub>2</sub> are used as part of the second component (see page 2 at middle section) or not.**

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Finally, the recitation of  $\text{SiO}_2\text{-Al}_2\text{O}_3$  may be changed to “ $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ ” or “a mixture of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ ” according to the art.

As already admitted by Applicants on page 9 at bottom section of Remarks, parent Claim 1 relates to an electrolytic composition comprising **two** major components including: (A) **at least one four-branched polymer** having a hybrid termination and (B) **one or more** compound selected from **PVDF, PVDF-HFP, PTFE, EDPM, polyvinyl alcohol, cellulose, ethylene oxide condensation products, PMMA, PAN,  $\text{SiO}_2\text{-Al}_2\text{O}_3$  or nano  $\text{TiO}_2$ .**

(d) On **Claim 1**, several improper things may need to be corrected. For instance, the sentence at last two lines of page 3 as “the organic material being selected from the group comprising at least one polyol and/or one polyethylene-polyoxyethylene copolymer and/or one inorganic material” is improper. Rewriting is necessary. Examiner suggests changing to “the organic material being selected from at least one polyol or at least one polyethylene-polyoxyethylene copolymer”. Certainly, inorganic material is not related to organic material at all in the art.

(e) On **Claim 1** at line 3, recitation “at least one four branched polymer” is confusing to ordinary skill in the art and may be better changed to “**at least one four-branched polymer**” for clarification.

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(f) On **Claim 4** at line 2, recitation of “LiTFSI” for inorganic salt is wrong. A correction to “**LiTFSI**” is needed.

### Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. The limitation of parent **Claim 1** in present invention relate to *polymer electrolyte for an electrochemical generator based on:*

(A) *at least one four branched polymer having a hybrid termination, wherein at least one branch of said four branched polymer is capable of giving rise to cross-linking;*

(B) *at least one component selected from the following families including: PVDF, PVDF-HFP, PTFE, EDPM, polyvinyl alcohol, ethylene oxide condensation product, PMMA and PAN;*

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*(C)  $\text{SiO}_2\text{-Al}_2\text{O}_3$ ; and*

*(D) nano  $\text{TiO}_2$  non-coated or coated with an organic material and to be compatible as specified.*

*See other limitations of dependent Claims 2-5.*

5. **Claims 1-5** are rejected under 35 U.S.C. 102(b) as being anticipated by **Kono et al. (US 6,399,254 B1 or its equivalent EP 880,189 A2)** or under 35 U.S.C. 102(a) and/or 102 (e) as being anticipated by **Ishiko et al. (US 6,190,804 B1 or its equivalent EP 923,147 A2)**.

Regarding “polymer electrolyte” limitation of parent **Claim 1**, each of **Kono and Ishiko** has individually disclosed the preparation of the claimed **composition of solid polymer electrolyte** comprising **four** components including: (A) a tetra-functionalized high-molecular compound for cross-linking purpose, (B) an electrolyte salt for conductivity purpose, (C) some polymer such as **PVDF or a low molecular weight alkylene oxide copolymer** for dilution purpose, (D) some organic solvent or solvent mixture.

6. To be specific, see **Ishiko** at abstract, line 1-18; columns 5-8 for using a tetra-functionalized terminal acryloyl-modified polymer having a formula (I) (equivalent to four-branched polymer, particularly see the four branch moiety at column 9, line 42-48), which is capable of crosslinking. See column **13-20** for the addition of **PVDF** dilution polymer in all working examples 1-13.



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See **Kono** at abstract, line 1-12; columns 4-8 for using a tetra-functionalized terminal acryloyl-modified polymer having a formula (I) (equivalent to four-branched polymer, particularly see the four branch moiety at column 8, line 11-15), which is capable of crosslinking. See column 1, line 20-22 for the addition of some dilution polymer(s) such as a **low molecular weight alkylene oxide copolymer** or polyvinyl chloride.

7. It is noted that open language “**comprising**” may be applied to the composition of Claim 1 according to current limitation. As already admitted by Applicants on page 9 at bottom section of Remarks, parent Claim 1 relates to an electrolytic composition comprising **two** major components including: (A) at least **one four-branched polymer** having a hybrid termination and (B) **one or more compound selected from PVDF, PVDF-HFP, PTFE, EDPM, polyvinyl alcohol, cellulose, ethylene oxide condensation products, PMMA, PAN, SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> or nano TiO<sub>2</sub>**. Accordingly, each of Kono and Ishiko anticipates current limitation of parent Claim 1.

8. Regarding the salt or salt mixture used in **Claims 2-4**, the disclosure by each reference would read on the limitations of Claims 2-4. For instance, see Ishiko at column 4, line 8-22; particularly see line 11 for lithium perchlorate (LiClO<sub>4</sub>), or the like. See Kono at column 3, line 32-45; particularly see line 35 for lithium perchlorate (LiClO<sub>4</sub>), or the like.

Regarding the organic solvent or organic solvent mixture used in **Claim 5**, the solvent disclosure by each reference would read on the solvent limitation of Claims 5. For instance,

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see Ishiko at column 3, line 55-65. See Kono at column 3, line 14-23; particularly see line 18 for the use of linear carbonate, or the like.

9. **Claims 1-4** are rejected under 35 U.S.C. 102(e) as being anticipated by **Kerr et al. (US 7,101,643 B2)**.

Regarding “polymer electrolyte” limitation of parent **Claim 1**, **Kerr et al.** have disclosed the preparation of the claimed **composition of solid polymer electrolyte** comprising **four** components including: (A) **terminal-functionalized polymer** in the form of a **comb branch type or dendrimer type** (which is equivalent to multi-branched polymer) for cross-linking purpose (with hydrosilylation reaction), (B) an electrolyte salt such as **LiTFSi** (see column 11, line 15-17) for conductivity purpose, (C) some polymer such as **PEO type polymer** for dilution purpose (see column 1, line 44-45), (D) organic solvent such as dimethoxyethane (see column 11, line 15-17).

10. It is also noted that open language “**comprising**” may be applied to the composition of Claim 1 according to current limitation. **As already admitted by Applicants** on page 9 at bottom section of Remarks, parent Claim 1 relates to an electrolytic composition comprising **two** major components including: (A) **at least one four-branched polymer** having a hybrid termination and (B) **one or more compound selected from PVDF, PVDF-HFP, PTFE, EDPM, polyvinyl alcohol, cellulose, ethylene oxide condensation products, PMMA, PAN, SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> or nano TiO<sub>2</sub>**. Therefore, Kerr anticipates current limitation of parent Claim 1.

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11. Regarding the salt or salt mixture used in **Claims 2-4**, the disclosure by Kerr reference would read on the limitations of Claims 2-4. For instance, see column 1, line 31-34; particularly see line 33 for lithium perchlorate ( $\text{LiClO}_4$ ), or the like. Also see the use of **LiTFSi** at column 11, line 15-17.

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. **Claim 5** is rejected under 35 U.S.C. 103(a) as obvious over Kerr et al. (US 7,101,643 B2) in view of Kono et al. (US 6,399,254 B1 or its equivalent EP 880,189 A2) or Ishiko et al. (US 6,190,804 B1 or its equivalent EP 923,147 A2).

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The above discussion of the disclosures of the prior art of Kerr for Claims 1-4 of this office action is incorporated here by reference. The above discussion of the disclosures of the prior art of Kono and Ishiko for Claims 1-5 of this office action is also incorporated here by reference. Regarding **Claim 5**, Kerr has already used polar aprotic organic solvent such as **dimethoxyethane**. Therefore, Kerr is still silent about specifically using the claimed type organic "aprotic" solvent(s) of Claim 5. Each of **Kono and Ishiko** in combination or alone has taught such a subject matter. For instance, see Ishiko at column 3, line 55-65. See Kono at column 3, line 14-23; particularly see line 18 for linear carbonate, or the like. By doing so, the electrolyte composition mixture becomes more homogeneous and therefore more effective.

14. In light of the fact that all involving references are dealing with making polymeric electrolyte by carrying fundamentally the same or similar four components including crosslinkable polymer, dilution polymer, salt and polar organic "aprotic" solvent, one having ordinary skill in the art would have therefore found it obvious to modify Kerr's process of making such a composition by adding or replacing with other polar organic "aprotic" solvent such as linear carbonate solvent as taught by Kono and/or Ishiko. One would expect all the embodiments in the same genus (polar "aprotic" organic solvent) would succeed based on functional equivalence and interchangeability. Additionally, more diversified and effective polymer electrolyte products may be obtained.

### Conclusion

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15. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu whose telephone number is (571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan, can be reached on (571) 272-1119. The fax number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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